Kagan Structures for Thinking Skills

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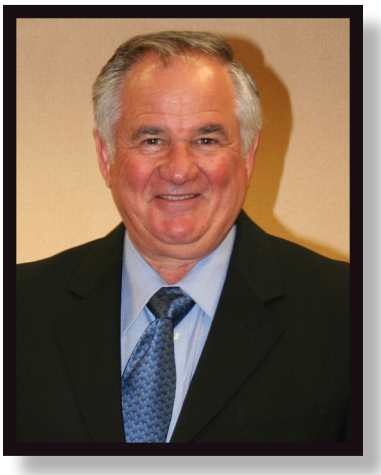


Educators worldwide increasingly recognize that we must revise our educational objectives if we are to prepare students for life in the 21st century. One dimension of primary concern is thinking skills. Thinking skills are an essential, if not the single most important element of a good 21st century curriculum.

A century ago, most people lived in rural areas and were employed in agriculture. The teacher had a good idea of what information and skills students would need for a lifetime. The teacher could prepare the student for a life in a predictable and relatively constant world. Today, we as teachers have the unprecedented challenge of preparing students for a world we can only dimly imagine. The change rate itself accelerates exponentially as new technology produces even newer technology. We take for granted picture phones, television watches, personal digital assistants, video conferencing, and GPS tracking devices that keep us updated in real time on traffic conditions—all of which were things of science fiction but a few decades ago. Think for a moment of all the things we have today that were not invented just a decade ago. We can no longer imagine with confidence what our lives will include a decade from now, never mind the myriad changes that will occur over the entire course of the lives of our students.

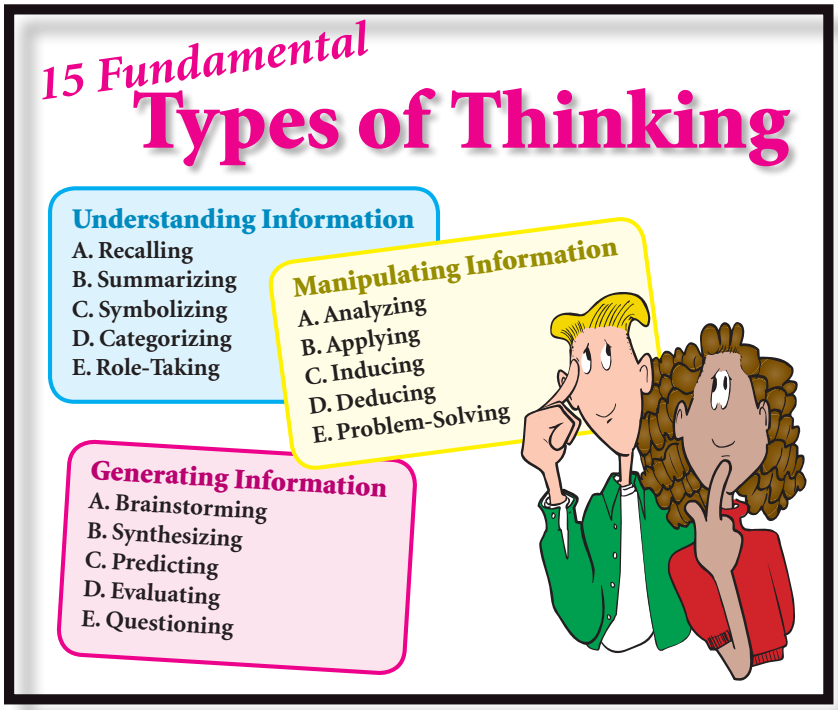
Preparation for accelerating change must include development of a full range of thinking skills. Change means adapting, and adapting means problem solving, predicting, questioning, applying old skills to new situations, and analyzing and evaluating options. We don't know the situations to which our students will have to adapt, but we do know they will need a range of thinking skills if they are to be successful.

We can predict with certainty also that our students will need information skills. The majority of all scientists who have ever lived are alive today, busy making new discoveries. Advanced computers are answering questions not yet formulated by humans; the sum of stored human information

doubles each year and the doubling rate itself is doubling so, during the lives of our students, the time it takes for human information to double will be measured in months, not years. In the face of the accelerating information explosion, having the student memorize one more fact is of little value compared to having the student learn how to categorize, analyze, synthesize, summarize, and apply information. Information memorized today will be outdated before our students graduate from high school; skills will be replaced many times over the course of a student's life. Improving the ability to generate new information is more important than trying to improve the human brain's capacity to store information—something even a handheld computer does far better.

The Information Processing Approach to Thinking

More and more people are employed in the information segment of the economy, and it is the fastest growing segment. In the information age, we earn our living by generating, analyzing, categorizing, evaluating, and communicating information. An information processing approach to thinking skills aligns well with preparation of students for 21st century life. The approach to teaching thinking skills that I developed and that Kagan Professional Development teaches is based on an information processing approach to thinking. This approach divides thinking skills into three types: understanding information, manipulating information, and generating information. In each of the three categories are specific skills. For example, recall is related to understanding information; deduction is related to manipulating information; and brainstorming is related to generating information. This division of skills into three sets of five is not perfect (for example, questioning is related to understanding, manipulating, and generating); nevertheless, it is quite useful. See "The 15 Fundamental Types of Thinking" sidebar.



Curricular Approach vs. Instructional Approach

There is consensus that information processing is the essence of thinking skills. The question becomes, How best to develop them? Two distinct approaches can be differentiated: A curricular approach and the instructional approach. We can change what we teach or we can change how we teach. A curricular approach treats thinking skills as an explicit curriculum and it demands we develop new content and teach new lessons; the instructional approach treats thinking skills as a

process and it demands we teach existing content and lessons using instructional strategies that foster thinking. Both approaches are useful, but we at Kagan have put our energies and intellects into developing the instructional approach to fostering the development of thinking skills.

We have developed a range of instructional strategies called structures to develop each of the 15 fundamental thinking skills:

Thinking Skill	Possible Structures		
Recalling	Flashcard Game	Showdown	Spin-N-Review
	Send-A-Problem	Numbered Heads	Stand-N-Share
	Find Someone Who	Rotating Review	
Summarizing	Idea Spinner	Spin-N-Think	Telephone
	Paraphrase Passport	Three Step Interview	
Symbolizing	Symbolizing	Formations	Think-Draw-RoundRobin
Categorizing	Similarity Groups	Think Pad	Brainstorming/ RoundRobin
	Team Word-Webbing	Sequencing	Pairs Compare
Role-Taking	Value Line-Ups	Paraphrase Passport	Match Mine
	Mix-Pair Discuss	Team Pair Share w/Response Gambit	
Analyzing	Same-Different	Jigsaw Problem Solving	Sequencing
	Match Mine	Spin-N-Think	
Applying	Team-Pair-Solo	Stir-the-Class	Numbered Heads Together
Inducing	Find My Rule	Think-Pair Share/Square	
Deducing	Mix-Pair-Discuss	Numbered Heads Together	Stir-the-Class
	Team Discussion with Roles	Inside-Outside Circle	
Problem Solving	Co-op Projects	Jigsaw Problem Solving	One Stray
	RoundRobin		
Brain Storming	Brainstorming	4S Brainstorming	RoundRobin
	Think Pad	RoundTable	Pairs Compare
Synthesizing	Team Statements	RoundRobin/RoundTable	
Predicting	Inside-Outside Circle	Numbered Heads Together	Corners
	RoundRobin		
Evaluating	Proactive Prioritizing	Timed Pair Share	Spend-A-Buck
	Spin-N-Think	Find-the-Fiction	
Questioning	Spinners	Three Step Interview	Who Am I?
	Team Interview	Q-Matrix	

To distinguish a curricular approach from the instructional approach, let's imagine we want to develop students' ability to summarize information. If we take a curricular approach we would design some lessons on summarizing. We might spend some time developing some summarizing worksheets. For example, the worksheet might include a paragraph and then, below, a place for the student to write a summary sentence. Or it might show a picture and have a place for the student to summarize what is going on in the picture using no more than 30 words.

In contrast, if we take the instructional approach, we would use our existing academic content, but teach that content using structures that foster summarizing skills. For example, as part of our lesson on the Great Depression we might pair up students, one student role-playing the part of a business executive who is just learning about the stock market crash, and another person role-playing the part of a widow who is unable to make mortgage payments and, so, has just lost her farm. While the students do this role-play they use the Paraphrase Passport structure. When this structure is used, before a student may speak, he or she must first paraphrase the person who spoke before him or her. Paraphrase is a form of summary, so students are acquiring summarizing skills without time away from existing curriculum.

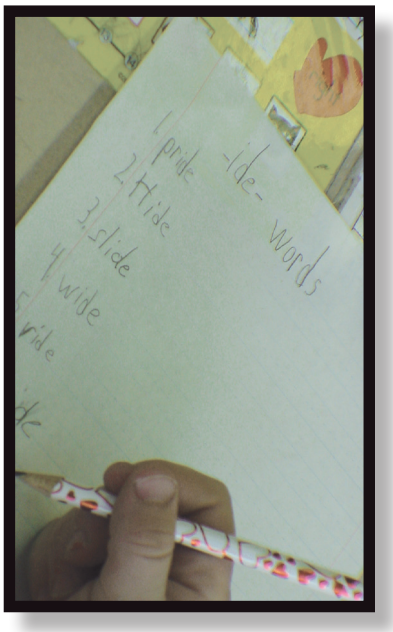
There are a number of **Kagan Structures** for each of the 15 fundamental types of thinking, and because many structures develop a range of thinking skills, a teacher who regularly uses a range of structures develops in students a rich repertoire of thinking skills. Thinking in many ways is simply part of the ongoing process in a classroom that regularly uses structures. There are a number of advantages to this instructional approach to thinking skills.

Not a Competing Curriculum. The instructional approach does not attempt to fit new lessons into an already overcrowded day; it is not something new to teach—It is a better way to teach. When thinking skills are a competing curriculum, they get dropped when there's pressure to cover existing curriculum and to prepare students for high-stakes tests. In contrast, with the instructional approach students acquire the skills while covering content or preparing for the test. In effect, the instructional approach permits more learning from each valuable minute of class time. At the same time the teacher is covering academic content the teacher is also fostering thinking skills. Thinking skills represent an embedded curriculum—a curriculum embedded into the way the teacher teaches.

Less Preparation. A curricular approach demands the teacher prepare special worksheets or lessons. In the worst case it demands the teacher spend the day teaching—and the night designing lessons. In contrast, the instructional approach demands no special preparation time. Once the structures are learned, they become part of how the teacher teaches on a daily basis.

Authentic Transfer. Special lessons on thinking skills create a transfer gap; the instructional approach sidesteps the transfer gap. In real life we do not fill in blanks on a worksheet. We do, though, interact with others, sometimes paraphrasing them. Because the instructional approach teaches the thinking skills in an authentic context similar to how thinking is used in real life, it avoids the transfer gap. A

transfer gap is created anytime the situation of acquisition is dissimilar to the situation of performance. The classic transfer gap was created in foreign language classes where students had to memorize lists of vocabulary and conjugations of verbs. Even students who did quite well on vocabulary and verb tests failed to become fluent in the language because the situation of acquisition was too dissimilar to the situation of performance. Thinking is not something we want students to do when faced with an inauthentic worksheet; is something we want to do in the full range of life's situations. Structures provide a broad range of authentic situations to promote thinking.



Rich in Redundancy. If we teach separate lessons on thinking skills, we are likely to teach each skill one time, then move on to the next. Learning, however, occurs via repetition. One worksheet on summarizing will never add up to enduring summarizing skills. If, however, the students use Paraphrase Passport (and other summarizing structures) all school year, they will become better at the skill. The same holds true for each of the thinking skills: the redundancy created by repeated use of the structures ensures students don't just learn about the skill but rather acquire the skill. A curricular approach has students glimpse the skill; the instructional approach has students grasp the skill.

Structures Grow Dendrite Connections

This last advantage of structures—redundancy—aligns with findings from brain science. We now know enough from brain science to conclude that the instructional approach has a huge advantage over a curricular approach for fostering thinking skills.

Recent research reveals that different types of thinking are associated with activity in different parts of the brain. Remarkably, when most people engage in deductive reasoning a very specific part of the brain's right hemisphere shows increased activity. Probabilistic reasoning, in contrast, is associated with increased activity in parts of the left hemisphere.[1] For details of this research and implications for Multiple Intelligences theory, see Kagan, Gardner, & Sylwester.[2] Each type of thinking is associated with different patterns of brain engagement. When we engage in evaluative thinking, parts of the prefrontal lobes as well as the limbic system are engaged. When we are analytic, there is left hemisphere activity; synthetic thinking is associated with right hemisphere activation.

Because different **Kagan Structures** activate different types of thinking, the structures actually stimulate specific and different parts of the brain! We do not grow new neurons as a result of thinking; we grow new dendrite connections. We are constantly rewiring our brains as we engage in different types of thinking. An axiom of applied brain science is "Use it or lose it." If we engage often in a type of thinking (as we do when we use structures repeatedly), we are actually strengthening dendrite connections, making that type of thinking easier and more likely in the future. If we engage in a type of thinking only very occasionally (as we do when we prepare one-time worksheets or lessons), the dendrite connections disappear over time. Thus, brain science supports the use of structures.

We need to think of thinking as a process, not a place. Thinking skills are not content to be placed into the brain. Rather, they are processes which, when practiced, empower the brain to work more efficiently. Teaching thinking skills with a curricular approach treats them as content; teaching them with the instructional approach treats them as processes. If years ago we took geometry but have not practiced it since, only with great difficulty, or not at all, can we today prove a theorem. Deductive reasoning, inductive reasoning, categorization skills and all the other thinking skills are the same: We use them or we lose them.

Like a muscle that atrophies following disuse, thinking skills taught as content and then dropped to make time for new content do not become well-developed, ongoing processes. Thus, the **Kagan Structures** are powerful tools to help us reach our goal of preparing students with the thinking skills they need to successfully navigate and thrive in the 21st century—a century characterized by a flood of information and an exploding change rate.

References

[1] Parsons, L. M. & D. Osherson, (2001, Oct.). New evidence for distinct right and left brain systems for deductive versus probabilistic reasoning. *Cerebral Cortex*, 11, 954-965.

[2] Kagan, S., H. Gardner, & R. Sylwester (2002, Fall). *Trialogue: Brain Localization of Intelligences.* Kagan Online Magazine.